

NOVEMBER/DECEMBER 2024

**GCH13/DCH13 — PHYSICAL
CHEMISTRY– I**

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define chemical potential.
2. Relate the activity and activity coefficient with ideal and non-ideal solutions.
3. Define eutectic point.
4. What is meant by degree of freedom?
5. Recall spread monolayer.
6. State streaming potential.
7. Write about the cage effect.
8. Define dielectric constant.
9. Define catalytic poisoning.
10. How does substrate concentration affect the enzymatic reaction?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Determine the activity and activity coefficient by the EMF method.

Or

- (b) Elaborate how the fugacity of gases is determined by the graphical method.

12. (a) Describe the phase behavior of the phenol-aniline system as a congruent melting system.

Or

- (b) Discuss the phase behavior of a system with acetic acid, chloroform, and water, focusing on their partial miscibility.

13. (a) Illustrate the role of reverse micelles in solubilizing hydrophobic substances.

Or

- (b) Explain how the molar mass of the proteins, like molecules, is determined by osmotic pressure measurement.

14. (a) Discuss the potential energy surface in the reaction kinetics with a suitable diagram.

Or

- (b) Describe the kinetic isotopic effect.

15. (a) Discuss the mechanism and kinetics of enzyme-catalyzed reactions.

Or

- (b) Derive the Michaelis-Menten equation.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the impact of temperature and pressure on fugacity.

17. Explain the liquid-liquid phase equilibrium in a system containing water, ethyl alcohol, and succinic nitrile.

18. Explain the impact of surfactant, temperature, organic materials, and electrolyte on the critical micelle concentration in a water medium.

19. Explain how the Hammett and Taft equations provide frameworks for understanding the substituents on aromatic or aliphatic compounds that influence the kinetics of chemical reactions.

20. Explain the kinetics of acid-base catalytic reactions.